FINAL TECHNICAL REPORT

"A SEARCH FOR LUMINOUS INFRARED-BRIGHT GALAXIES USING INFRARED ASTRONOMICAL SATELLITE (IRAS) ARCHIVAL DATA

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Our one year program to expand the *Search for Luminous Infrared-Bright Galaxies Using IRAS Archival Data* (NAG 5-1251)[1] was successfully completed, the final result being the compilation of the IRAS *Extended Bright Galaxy Sample* (EBGS). Two papers have been prepared for publication: the first (Sanders *et al.* 1991) presents the infrared data for 280 galaxies that comprise the EBGS, and combines these data with the original IRAS *Bright Galaxy Sample* (BGS; Soifer *et al.* 1989) to provide a complete flux-limited list of 600 galaxies with S(60μm) $>$ 5.24 Jy over the entire sky above a galactic latitude of 10°; the second (Egami *et al.* 1991) presents a list of 65 galaxies at galactic latitude 5°-10° for which the completness criteria are not as secure. A secondary effort to expand the original IRAS *Warm Galaxy Survey* (WGS; Sanders *et al.* 1988) was dropped in order to successfully carry out the primary task of completing the BGS survey down to galactic latitude 5°.

The bulk of the data analysis supported by NAG5-1251 was carried out by Eiichi Egami, a second year graduate student at the Institute for Astronomy, University of Hawaii. Eiichi was supported for two full-time summer months, and half-time for nine months during the 1989-90 academic year. The initial stages of our research were carried out during a two-week visit by Egami and the P.I. to the Infrared Processing and Analysis Center (IPAC) at Caltech during August 1989. Candidate lists of bright infrared galaxies were selected from the IRAS Point Source Catalog (PSC–version II) using IPAC software. The lists were cross-correlated with other astronomical catalogs to weed out known galactic objects, primarily reddened stars, molecular cloud cores, and planetary nebula. Overlays were made for the remaining sources ($\sim$600) to identify their position on the Palomar Sky Survey (PSS), and photographs were then made to use as finding charts. Approximately 40% of the sources were found to be associated with cataloged galaxies with known redshift, and another 10% with 'infrared-only' identified galaxies or optically identified galaxies with unknown redshift. The remaining objects required optical spectroscopy to determine their type. Previously awarded observing time at Mauna Kea (Sanders, Egami), and in Chilie (Mirabel, Lipari), was used to obtain redshifts for these objects during the course of the grant year. Approximately 30 of the 300 unidentified objects were eventually identified as galaxies – several of these being the most distant and luminous objects in the EBGS.

The second stage of our research began with requests to IPAC for 1-D ADDSCANS for all of the sources in the EBGS. The ADDSCAN printouts and plots were analysed by hand to determine total fluxes for each source in each wavelength band, and to characterize each observation as unresloved (U), partially resolved (U^+), or resolved (R). The final tables for the EBGS include source positions, total fluxes in the four IRAS bands, infrared colors, and total infrared luminosities obtained using ADDSCAN data. Before the final merger of the EBGS list with the original BGS, an additional search of the IRAS PSC was carried out in order to identify extended objects whose PSC flux was below the completeness limit of the BGS, but whose total flux was above the limit. Ten additional sources were found bringing the total number of EBGS objects to 286 at $|b| > 10°$, and 67 at $|b| = 5° - 10°$.

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[1] The NASA Technical Officer for this grant is Dr. Donald K. West, NASA Goddard Space Flight Center, Laboratory for Astronomy and Solar Physics, Space and Earth Sciences Directorate - Code 684, Greenbelt, MD 20771

A full description of the EBGS is given in Sanders *et al.* (1991). This paper also includes a merged list of the EBGS and BGS which represents the only published copy of the all-sky IRAS *Bright Galaxy Survey*. It is anticipated that this list will become an important reference for future studies of infrared galaxies. The galaxies tabulated in Egami *et al.* (1991) also represent an important sample in that relatively few redshifts have been published for galaxies at galactic latitudes less than 10°. Sanders *et al.* (1991) also determine a new infrared galaxy luminosity function from the all-sky BGS whose slope is slightly smaller than previously determined from the original BGS, due in part to the reduced uncertainty in the space density of the most luminous objects, and a shift of the 'knee' in the luminosity function to slightly lower luminosity. The space density of 'ultraluminous' infrared galaxies ($L_{ir} > 10^{12}\ L_{\odot}$) is found to exceed that of optical quasars of comparable bolometric luminosity by a factor of $\sim$1.5 .

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